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10/727,250	12/04/2003	Yukihiko Nakata	246247US2	5415
22850	7590	09/16/2005		
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER DHINGRA, RAKESH KUMAR	
			ART UNIT	PAPER NUMBER
			1763	
DATE MAILED: 09/16/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/727,250

Applicant(s)

NAKATA ET AL.

Examiner

Rakesh K. Dhingra

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 August 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 6-8, 12, 13 and 18-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 9-11 and 14-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 12/03, 9/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### ***Election/Restrictions***

Applicant's election with traverse of Species 1 with Claims 1-17 identified as reading on the elected species in the reply filed on 8/8/05 is acknowledged. The traversal is on the grounds that the claims of Species 1-15 appear to be part of an overlapping search area. This is not found persuasive because the claims to Species 1-15 pertain to distinctly different inventions and accordingly the inventions of these species are not fully coextensive.

The requirement is still deemed proper and is therefore made FINAL.

Accordingly, Claims 18-23 withdrawn from further consideration pursuant to CFR 1.142 (b) as being drawn to non-elected species. Election was made with traverse in the reply filed on 8/8/05.

Additionally Claims 6-8, 12, 13 were withdrawn from consideration by the examiner since these do not pertain to the elected species [Species 1], (Claims 6-8 pertain to Species 8, Figures 11a, 11B and Claims 12, 13 pertain to Species 11, Figures 16A, 16B).

### ***Drawings***

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description:

1) Figures 16A, 16B: Reference No. 22 is not shown as mentioned in the disclosure (page 108, line 19);

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement

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drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

The disclosure is objected to because of the following informalities:

- 1) Page 91, line 17 – it is suggested to change "It make" to "It makes";

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claim 14 is rejected under 35 U.S.C. 102(b) as being anticipated by Ishii (US Patent No. 6,796,268).**

Ishii teaches a plasma processing apparatus (Figures 1a-b) for performing a plasma processing, comprising an electromagnetic wave source 3 for generating an electromagnetic wave, an electromagnetic wave connecting (distributing) waveguide portion 4 for transmitting the electromagnetic wave generated from the electromagnetic

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wave source, a waveguide 5a, 5b connected to the electromagnetic wave distributing waveguide portion, a plurality of slots 6a, 6b formed on the waveguide and constituting a waveguide antenna 2, an electromagnetic wave radiation window 10 consisting of a dielectric body and arranged to face the plural slots, and a vacuum chamber 1 including the electromagnetic wave radiation window as an incident surface of the electromagnetic wave, wherein a plasma is generated by the electromagnetic wave radiated from the slots into the vacuum chamber through the electromagnetic wave radiation window 10, the plasma processing apparatus being constructed such that: the plasma processing apparatus includes a plurality of the waveguides 5a, 5b; the electromagnetic wave distributing waveguide portion 4 serves to distribute the electromagnetic wave generated from the electromagnetic wave source 3 into each of the plural waveguides 5a, 5b; and wherein the slots 6a, 6b are distributed substantially uniformly over the entire area that is to be subjected to the plasma processing (Column 3, line 43 to Column 4, line 61).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were

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made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1, 2, 4, 9, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Naoki (JP Pub. No. 11-111493) in view of Yuichi et al (JP Pub. No. 2002-280196).**

Naoki teaches a plasma processing apparatus (Figures 1,2) for performing a plasma processing, comprising an electromagnetic wave source 26 for generating an electromagnetic wave, a waveguide 23, an electromagnetic wave radiation window 4 consisting of a dielectric body, and a vacuum chamber 1, wherein a plasma is generated by an electromagnetic wave radiated into the vacuum chamber through the electromagnetic wave radiation window, the plasma processing apparatus being constructed such that:

the plasma processing apparatus includes a plurality of the waveguides 28a, which are arranged in contact with each other;

the plasma processing apparatus includes an electromagnetic wave distributing waveguide portion 27 for distributing the electromagnetic wave from the electromagnetic wave source into the plural waveguides 28a, and

the electromagnetic wave radiation window 4 constitutes a part of the wall of the

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vacuum chamber 1, and the vacuum condition is retained between the electromagnetic wave radiation window and the other wall of the vacuum chamber.

Naoki does not teach plurality of slots formed on the waveguide that constitute a waveguide antenna.

Yuichi et al teach an apparatus (Figures 1-4) that has a plurality of waveguides 42, 43, 44 with plurality of coupling holes (slots) 42a-c, 43a-c, 44a-c for coupling the microwaves from the waveguides to the reaction chamber 41 (Paragraph 0015).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use waveguides with slots as taught by Yuichi et al in the apparatus of Naoki to provide increased homogeneity of plasma consistency (Paragraph 0008).

Regarding Claim 2: Naoki teaches that each of the plural waveguide 28a-d is branched from the electric filed plane (paragraphs 0028, 0031).

Regarding Claim 4: Naoki teaches that the electromagnetic wave distributing waveguide portion 27 and the plural waveguides 28a-d are arranged on substantially the same plane (Figures 1-3 and Paragraphs 0025-0027).

Regarding Claims 9, 11: Yuichi et al teach that a plurality of electromagnetic wave radiation windows 45 are arranged such that the vacuum condition is maintained between the plural electromagnetic wave radiation windows and the vacuum chamber 41 (Paragraph 0019).

**Claims 3, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Naoki (JP Pub. No. 11-111493) in view of Yuichi et al (JP Pub. No. 2002-280196) as applied to Claim 1 and further in view of Noguchi (US Patent No. 6,607,633).**

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Regarding Claim 3: Naoki teaches all limitations of the claim including that the electromagnetic wave distributing waveguide portion 27 serves to distribute the electromagnetic wave generated from the electromagnetic wave source 26 into each of the plural waveguides 28a-d.

Naoki does not teach that the transmission direction of the electromagnetic wave is bent at substantially right angles in the electromagnetic wave distributing waveguide portion.

Noguchi teaches an apparatus (Figures 3) that has electromagnetic waves bent at substantially right angles (Figures 7A, 7B) when being distributed from the waveguide 11 to the branching radiative parts 12 (plural waveguides) [Column 4, line 57 to Column 5, line 21).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use electromagnetic waves bent at substantially at right angles (Figures 7A, 7B) when being distributed as taught by Noguchi in the apparatus of Naoki in view of Yuichi et al to maximize plasma generation efficiency (Column 2, lines 25-30).

Regarding Claim 10: Yuichi et al teach that a plurality of electromagnetic wave radiation windows 45 are arranged such that the vacuum condition is maintained between the plural electromagnetic wave radiation windows and the vacuum chamber 41 (Paragraph 0019).

**Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Naoki (JP Pub. No. 11-111493) in view of Yuichi et al (JP Pub. No. 2002-280196) as applied to Claim 1 and further in view of Mabuchi et al (US Patent No. 5,788,798).**



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Naoki in view of Yuichi et al teach all limitations of the claim except distance between inner surfaces of adjacent waveguides.

Mabuchi et al teach an apparatus (Figure 8) that has adjacent waveguides 21a, 21b, separated by a metallic wall 30 and where the distance between the waveguides is not larger than the inner widths 213a, 213b of the waveguides (Column 6, lines 20-51).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use waveguides as configured by Mabuchi et al in the apparatus of Naoki in view of Yuichi et al to maintain uniformity of plasma for large area substrates.

**Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii (US Patent No. 6,796,268) in view of Tadera et al (US patent No. 6,726,802).**

Regarding Claim 15: Ishii et al teach a plasma processing apparatus for performing a plasma processing comprising an electromagnetic wave source 3 for generating an electromagnetic wave, an electromagnetic wave distributing waveguide portion 4 for transmitting the electromagnetic wave generated from the electromagnetic wave source, a waveguide 5a, 5b connected to the electromagnetic wave distributing waveguide portion, a plurality of slots 6a, 6b formed on the waveguide and constituting a waveguide antenna 2, an electromagnetic wave radiation window 10 consisting of a dielectric body and arranged to face the plural slots, and a vacuum chamber 1 including the electromagnetic wave radiation window 10 as an incident surface of the electromagnetic wave, wherein a plasma is generated by the electromagnetic wave radiated from the slots into the vacuum chamber through the electromagnetic wave radiation window, the plasma processing apparatus being constructed such that:

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the plasma processing apparatus includes a plurality of the waveguides 5a, 5b; the electromagnetic wave distributing waveguide portion 4 serves to distribute the electromagnetic wave generated from the electromagnetic wave source 3 into each of the plural waveguides 5a, 5b.

Ishii et al do not teach plurality of windows to correspond commonly to the plural slots.

Tadera et al teach an apparatus (Figures 1, 2, 9) that has plurality of windows 11 that are hermetically arranged in a manner to correspond commonly to the plural slots (slot plate 4), and the vacuum condition is maintained between the plural electromagnetic wave radiation windows 11 and the vacuum chamber 2 (Column 4, line 52 to Column 5, line 5 and Column 8, lines 60-67).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use plurality of windows as taught by Tadera et al in the apparatus of Ishii et al to maintain uniformity of plasma process for large area substrates.

**Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii (US Patent No. 6,796,268) in view of Tadera et al (US patent No. 6,726,802) and further in view of Mabuchi et al (JP Pub. No. 8-316198).**

Regarding Claim 16: Ishii teaches all limitations of the claim (as already explained under Claim 15 above) except for window length, width.

Ishii in view of Tadera et al do not teach width, length etc of the windows.

Mabuchi et al teach an apparatus (Figure 5) that has rectangular waveguides 21a, 21b facing coupling windows 4a, 4b wherein the length, width and period of the window are substantially same as that of the waveguides. Mabuchi et al also teach that the major

axis direction of the waveguides 21, 21b substantially coincides with that of the radiation windows 4a, 4b (Paragraph 0032, 0034).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a radiation window having dimensions substantially equal to that of the waveguide as taught by Mabuchi et al in the apparatus of Ishii in view of Tadera et al to improve homogeneity of plasma propagation (Paragraphs 0014-0017).

**Claim 17 is are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii (US Patent No. 6,796,268) in view of Tadera et al (US patent No. 6,726,802) and Mabuchi et al (JP Pub. No. 8-316198) as applied to Claim 16 and further in view of Mabuchi et al (US Patent No. 5,645,644).**

**Regarding Claim 17:** Ishii in view of Tadera et al and Mabuchi et al teach all limitations of the claim except length of window shorter than that of waveguide.

Mabuchi et al ('644) teach an apparatus (Figures 2A, 3A) that has 4 windows 6 and dielectric (waveguide) 21 and the windows are smaller in length as compared to the waveguide (Column 6, lines 1 to 15 and Column 8, lines 1-8).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use window smaller in length as taught by Mabuchi et al ('644) in the apparatus of Ishii in view of Tadera et al and Mabuchi et al ('198) to enable more durability of the windows.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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**Yamamoto et al (US Patent No. 6,620,290)** teach a microwave plasma apparatus (Figures 1-3) that has plurality of adjacent waveguides 3a, 3b and plurality of microwave introduction windows 2a, 2b that are non-equivalent in locational relationship and suitable microwave power is applied from oscillators 6a, 6b.

**Akimoto (US patent No. 6,189,481)** teaches a microwave plasma apparatus (Figure 3A, 3B) that has a source 26, waveguide 24, dielectric 22 and where plurality of radiation ports (slots) 32 are adjustable for changing their respective areas for better control of the plasma.

**Perrin (US Pub. No. 2003/0178143)** teaches a microwave plasma apparatus (Figure 1, 2) that has a plurality of waveguides 161, 162, 163 a quartz window 175 and where different levels of powers can be applied to three waveguides using multiple microwave sources 185, 186, 187.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Rakesh Dhingra



Parviz Hassanzadeh  
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Art Unit 1763